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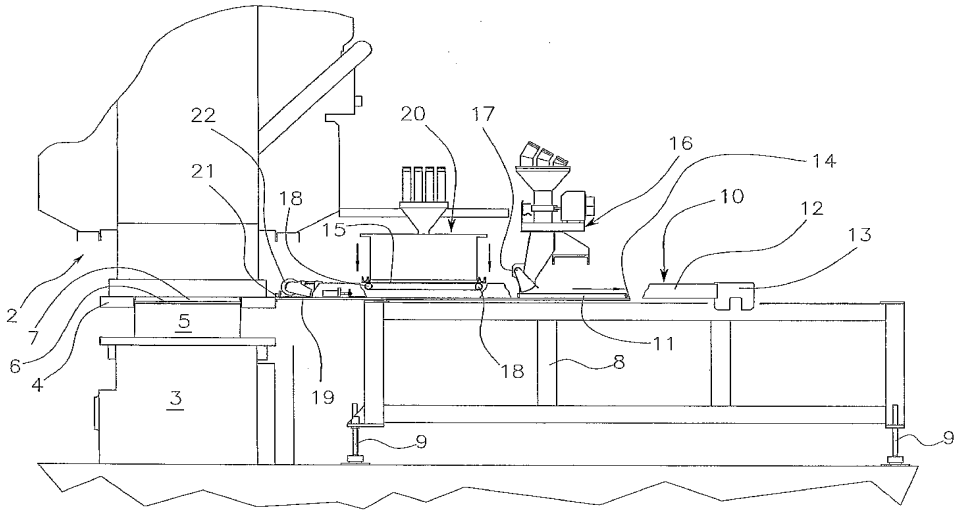
(54) Title: PLANT FOR FEEDING A DOUBLE LAYER OF POWDER OR GRANULAR MATERIAL INTO THE CAVITY OF THE MOULD FOR CERAMIC TILE PRODUCTION



(57) Abstract: A plant (1) for feeding a double layer of powder or granular material into a cavity (6) of the ceramic tile production mould, comprising: a loading carriage (10) which has at least one loading tray (11) with plan dimensions equal to those of the mould cavity (6), is arranged to receive a first material, and is driven with reciprocating movement between a retracted position in which the carriage (10) frees said cavity, and an advanced position in which the loading tray (11) releases said first material into the underlying mould cavity (6); a belt feeder (15) associated with said carriage (10) and arranged to receive a second material to be released into the cavity (6) above said first material, in which that said loading tray (11) is slidable on said carriage (10) between a retracted position, where said tray (11) receives said first material, and an advanced position, where said tray (11) lies below said belt feeder (15).

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DESCRIPTION

PLANT FOR FEEDING A DOUBLE LAYER OF POWDER OR GRANULAR MATERIAL INTO THE CAVITY OF THE MOULD FOR CERAMIC TILE PRODUCTION

TECHNICAL FIELD

The present invention relates to a plant for feeding a double layer of powder or granular material into the cavity of the mould for ceramic tile production.

BACKGROUND ART

To obtain certain aesthetic effects in tiles, it is known to fill the mould cavity with several materials having different characteristics, in particular their colour. In this manner graduated regions of different colours (or other characteristics) are obtained, typically in imitation of natural stone.

In the ceramic tile production sector, the so-called pressure-glazing method has been used for some time.

With this method, a layer of at least one base material generally in powder form, for example atomized clay, is firstly deposited in the at least one forming cavity of a usual ceramic mould to constitute about 70-80% of the product thickness and provide the final tile with adequate mechanical strength.

A second layer, which can consist of coloured powders or glazes of different particle size, is deposited on the base layer to obtain the desired aesthetic effect.

The two layers are then compacted by the press to obtain an already decorated tile which is then fed to firing.

To feed said superposed layers of generally powder materials, such as said atomized clay and glaze, into the mould cavity, plants are known comprising a feed carriage having, for loading the base clay, at least one upperly and lowerly open tray provided with a suitable grid for feeding the mould cavity.

Each tray presents a plan configuration substantially corresponding to that of the mould cavity.

In addition, the carriage supports an externally projecting horizontal belt feeder for the powdered glaze.

Essentially the belt feeder and the grid-comprising tray are positioned side by side and fixed to the carriage, the first externally and the second internally.

The carriage is slidable with reciprocating rectilinear movement on a continuous flat horizontal surface positioned as a continuation of the upper surface of the mould die plate in which the cavity to be filled is provided.

The carriage is driven synchronously with the press operations, between a retracted position in which the grid-comprising loading tray receives the base material while the belt receives the coloured powders, and a completely advanced position in which the tray overlies the mould cavity, hence the base material falls from the tray into the cavity.

On its return from the completely advanced to the retracted position, the carriage assumes a partially advanced position, in which the belt feeder

allows the coloured powders to fall onto the base material already fallen into the cavity.

In other words, when in its completely advanced position, the belt passes beyond the cavity which is filled with the base material, then during its return to the retracted position, when in its partially advanced position, the belt is rotated and the overlying powder falls into the cavity to form the second layer above the base material prior to the pressing stage.

In passing from its retracted position to its advanced position the carriage loading tray is closed lowerly by the flat surface along which it slides.

In the known art, the tray present in the carriage is loaded by an overlying hopper the lower mouth of which has a transverse dimension (i.e. perpendicular to the carriage movement) equal to the transverse dimension of the tray, whereas the longitudinal dimension is substantially less than the corresponding tray dimension.

Consequently, the tray is loaded continuously about its retracted position.

The belt feeder, positioned external to the carriage and fixed to it, is loaded with coloured powders by devices of the known art which often require a longer loading time than that required for loading the base material.

In this respect, although the tray in the carriage is loaded with the base material forming the first layer while the carriage is sliding, the belt is loaded with the powders forming the second layer while the carriage is at rest, by a loading device which becomes positioned above the belt and releases the powder layer through a plurality of outlets located along the entire extent of the belt, to then be transferred into the mould cavity.

Hence the loading of the grid-comprising tray and consequently the movement of the carriage to its advanced position can only begin after the powder layer has been loaded onto the belt.

This results in certain drawbacks and disadvantages, in that the total duration of the loading cycle is equal to the sum of the time for loading the coloured powders onto the belt and the time for loading the clay powders into the grid-comprising tray.

Consequently, productivity is relatively low.

In addition, to feed the cavity with the base clay powders, the carriage is moved into the completely advanced position, so bringing the belt beyond the cavity, with possible spillage of the overlying coloured powders and consequent soiling of the mould.

There is hence a strongly felt requirement for a plant for feeding a double layer of powder or granular material into the cavity of the mould for ceramic tile production by which the powder loading times are reduced, with consequent reduction in the time for forming the corresponding tile.

DISCLOSURE OF THE INVENTION

The object of the present invention is to provide a plant for feeding a double layer of powder or granular material into the cavity of the mould for ceramic tile production, which has structural and functional characteristics such as to obviate the stated drawbacks of the known art.

This object is attained by a plant for feeding a double layer of powder or granular material into the cavity of the mould for ceramic tile production in accordance with claim 1.

The dependent claims define particularly advantageous preferred embodiments of the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the invention will be apparent on reading the ensuing description provided by way of non-limiting example, with the aid of the figures shown in the accompanying drawings, in which:

Figure 1 is a schematic side view of a plant for feeding a double layer of powder or granular material into the cavity of the mould for ceramic tile production in accordance with the present invention, during an operative stage;

Figure 2 shows the plant of Figure 1 during the carriage start stage;

Figure 3 shows the plant of Figure 1 during the stage of loading the base material into the mould cavity;

Figure 4 shows the plant of Figure 1 during the stage of loading the material of the second layer;

Figure 5 shows the plant of Figure 1 during the final stage of loading the material of the second layer;

Figure 6 shows the plant of Figure 1 during the carriage return stage.

BEST MODE FOR CARRYING OUT THE INVENTION

With reference to said figures, the reference numeral 1 indicates overall a plant for feeding a double layer of powder or granular material into the cavity of the mould for ceramic tile production.

The figures show schematically a press 2 of any known type.

A die plate 4 and a lower mould die 5 are positioned on the bed 3 of the press 2 to together define the forming cavity 6.

The cavity 6 can have any shape. In addition, several cavities 6 can be provided in the same mould to form several tiles simultaneously (multiple mould).

The vertically movable upper die 7 is positioned on the upper part of the press.

The cavity (or cavities) 6 is filled with a first material, generally powdered clay, forming the first layer, which is fed by a loading carriage 10 having, for each cavity 6, a loading tray 11 provided with a usual grid having plan dimensions substantially corresponding to those of the forming cavity 6.

The carriage 10 possesses two lateral sidepieces 12, only one of which is partly visible in the figures, which, to enable it to slide only in a longitudinal horizontal direction, are secured, by guide means 13 of known type, to a fixed support structure 8 provided with feet 9 for its resting on the ground.

The carriage 10 is driven to and fro in said longitudinal direction by known means, for example a motor-driven crank, not shown, between a retracted position, shown in Figures 1, 2, and an advanced position, shown in Figures 3, 4, in which the tray 11 lies above the cavity 6 into which it releases its contained material.

If the mould is of multiple type, the number of loading compartments 11 provided is equal to the number of cavities 6, they having the same arrangement as the cavities 6.

The tray 11 slides along and in contact with a horizontal fixed sliding surface 14, coplanar with the upper surface of the die plate 4 and adjacent thereto.

The surface 14, together with the upper surface of the lower die 5, maintains the bottom of the tray 11 closed while the carriage 10 passes from its retracted position to its advanced position.

The forming cavity 6 into which the powder falls by gravity is created by lowering the die 5.

To form the second layer, the cavity 6 is fed with a second material by a belt feeder 15 associated with the carriage 10 and described in detail hereinafter.

According to the present invention, the grid-comprising loading tray 11 slides with reciprocating movement within the carriage 10, between a retracted position shown in Figure 1, in which the tray 11 receives the base material, and an advanced position shown in Figure 3, in which the tray 11 is positioned below the belt feeder 15.

For example, the drive means for the loading tray 11 can be a system of belts located below the surface 14 and to which the tray becomes coupled after being reversibly released from the carriage 10 by, for example, an actuator 19.

When in its loading position, retracted on the carriage 10, the tray 11 is loaded with powder material by usual known means.

For example (as shown in the figures) these means comprise a fixed discharge hopper 16 orientated transversely to the travel direction of the carriage 10 and loading tray 11, and with its lower mouth opened and closed by a rotating shutter 17.

The belt feeder 15, or simply belt, has a greater longitudinal dimension than the loading tray 11 for the first material, and is located above said tray 11 when this latter is in its advanced position on the carriage 10.

In contrast to the loading tray 11, the belt 15 is irremovably associated with the carriage 10 at its front end, i.e. that close to the cavity 6.

The belt 15 is a usual endless belt passing about a pair of rollers 18 at its two ends, and is driven by one of the two rollers 18 provided with a motor.

Again in this case, several belts 15 can be provided to feed several cavities simultaneously.

The belt 15 is loaded with the second material, generally powder colour pigments, to form the second layer in the cavity 6.

The belt 15 is loaded discontinuously by usual loading means.

The example shows a colour loading device 20 movable vertically between a lower release position, shown in Figure 1, and an upper stand-by position, shown in the remaining figures.

Operatively, the plant 1 of the present invention enables a method to be implemented for feeding a double layer of powder or granular material into the cavity 6 of the mould for ceramic tile production

In the initial stage of the tile production cycle, the carriage 10 is in its retracted position and the grid-comprising loading tray 11 is in its retracted position on the carriage 10 (Figure 1).

The colour loading device 20 is brought into its lower colour release position to rest on the belt 15 associated with the carriage 10.

The thickness and dimension of the colour layer loaded onto the belt 15 can be defined by a sized screen of known type.

During transfer of the powder layer onto the belt 15, the grid-comprising tray 11 slides within the carriage 10, which is at rest in its retracted position, to arrive below the belt 15, but without grazing it.

During its advancement, the tray 11 is loaded with the base clay powders falling from the hopper 16.

On arriving below the belt 15, the tray 11 is coupled to the carriage 10, the colour loading device 20, which has released the colour layer, then withdrawing from the belt 15 by moving upwards into its stand-by position (Figure 2).

The carriage 10 together with the tray 11 coupled to it and together with the belt 15 slides into its completely advanced position with the tray 11 above the cavity 6 (Figure 3).

In moving into its completely advanced position the carriage 10, as is known, pushes the previously formed tile forwards by a thrust means 21 positioned at the front end of the carriage, to hence free the mould surface on the press.

When the carriage 10 reaches the end of its advancement travel, the lower die 5 is lowered by a predetermined amount to form the cavity 6, which receives the base material contained in the overlying tray 11.

This material flows into the mould cavity 6 by simple gravity action.

At this point the tray 11 is released from the carriage 10 and is coupled to the belt system to begin to retract within the carriage 10 and scrape the powder just loaded into the mould.

When scraping is complete, the carriage 10 begins to retract and the cavity 6 is further loaded, after further lowering the lower die 5, by the passage of the belt 15 thereover during the return travel of the carriage 10 (Figure 4).

In this respect, this latter releases onto the base material deposited by the tray 11 a complementary quantity of different material, which in the

example is of different colour, to completely occupy the upper part of the mould cavity 6.

The colour layer is released into the cavity 6 while the carriage 10 returns to its retracted position with simultaneous rotation of the belt 15.

Essentially, while the carriage 10 slides rearwards together with the tray 11 and belt 15, the belt, which has a longitudinal dimension just greater than the underlying tray 11 so as to project beyond it, is rotated to cover the cavity 6 with the colour.

To obtain a homogeneously deposited colour layer, the rotational speed of the belt 15 is equal to the speed of translation of the underlying carriage 10.

By operating at the same speed, the achieved transfer of coloured powders fairly faithfully reproduces the surface arrangement previously obtained on the belt.

When the second layer has been fed into the cavity 6 (Figure 5), the belt 15 is halted and the carriage 10 continues to slide rearwards.

When the belt 15 arrives below the colour loading device 20, the tray 11 has already reached within the carriage 10 its retracted position, in which it receives the powder.

The press 2 is closed and the upper die 7 descends into the cavity 6 to form the desired tile (Figure 1).

To clean the surface 14 along which the carriage 10 slides, a usual rotating brush 22 can be provided, located in the front region of the carriage 10.

When the carriage reaches its retracted position, a new loading cycle commences in which the colour loading device 20 rests on the belt 15 and the loading tray 11 slides below the hopper 16 to receive the clay.

The aforedescribed cycle loads the mould cavity with the base material covered by the complementary second layer of decorative material, the tile being moulded with the decorative material lying above.

If the tile is to be moulded in the inverted position, i.e. with the decorative material lying below the base material, the belt merely has to be operated during the carriage advancement movement, so that the fall of the decorative material precedes the fall of the base material.

In this case, complete advancement of the tray within the carriage can be suitably delayed.

From the aforegoing description it will be apparent that the plant for feeding a double layer of powder or granular material into the cavity of the mould for ceramic tile production according to the present invention satisfies those requirements and overcomes those drawbacks stated in the introduction to the present description with reference to the known art.

In this respect, the feed plant of the present invention enables the belt and tray to be simultaneously loaded, so simultaneously reducing carriage travel.

This enables a much larger quantity of tiles to be obtained per unit of time than the quantity obtainable with plants of the known art.

An expert of the art can apply numerous modifications and variants to the aforedescribed plant to satisfy specific contingent requirements, all of which however are contained within the scope of protection of the invention, as defined by the following claims.

CLAIMS

1. A plant (1) for feeding a double layer of powder or granular material into a cavity (6) of the mould for ceramic tile production, comprising:

- a loading carriage (10) which has at least one loading tray (11) with plan dimensions corresponding to those of the mould cavity (6), is arranged to receive a first material, and is driven with reciprocating movement between a retracted position in which the carriage (10) frees said cavity, and an advanced position in which the loading tray (11) releases said first material into the underlying mould cavity (6);

- a belt feeder (15) associated with said carriage (10) and arranged to receive a second material to be released into the cavity (6) above said first material,

characterised in that said loading tray (11) is slidable on said carriage (10) between a retracted position, in which said tray (11) receives said first material, and an advanced position, in which said tray (11) lies below said belt feeder (15).

2. A plant (1) as claimed in claim 1, wherein said belt feeder (15) has a longitudinal dimension greater than that of the loading tray (11) for the first material.

3. A plant (1) as claimed in claim 1, wherein said loading tray (11) is provided with a grid.

4. A plant (1) as claimed in claim 1, wherein said loading tray (11) is driven to slide relative to said carriage (10) by a belt system.

FIG.1

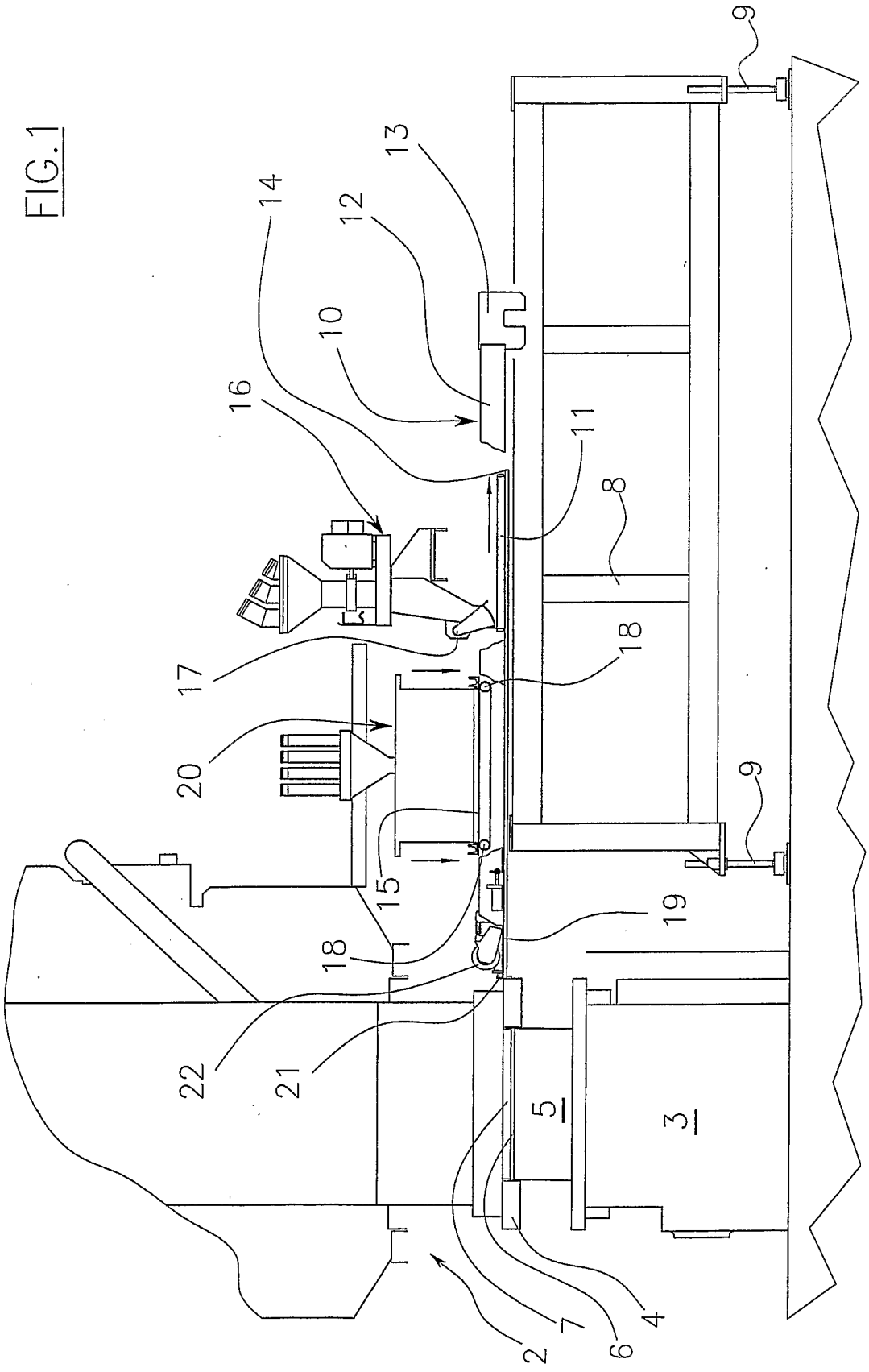


FIG.2

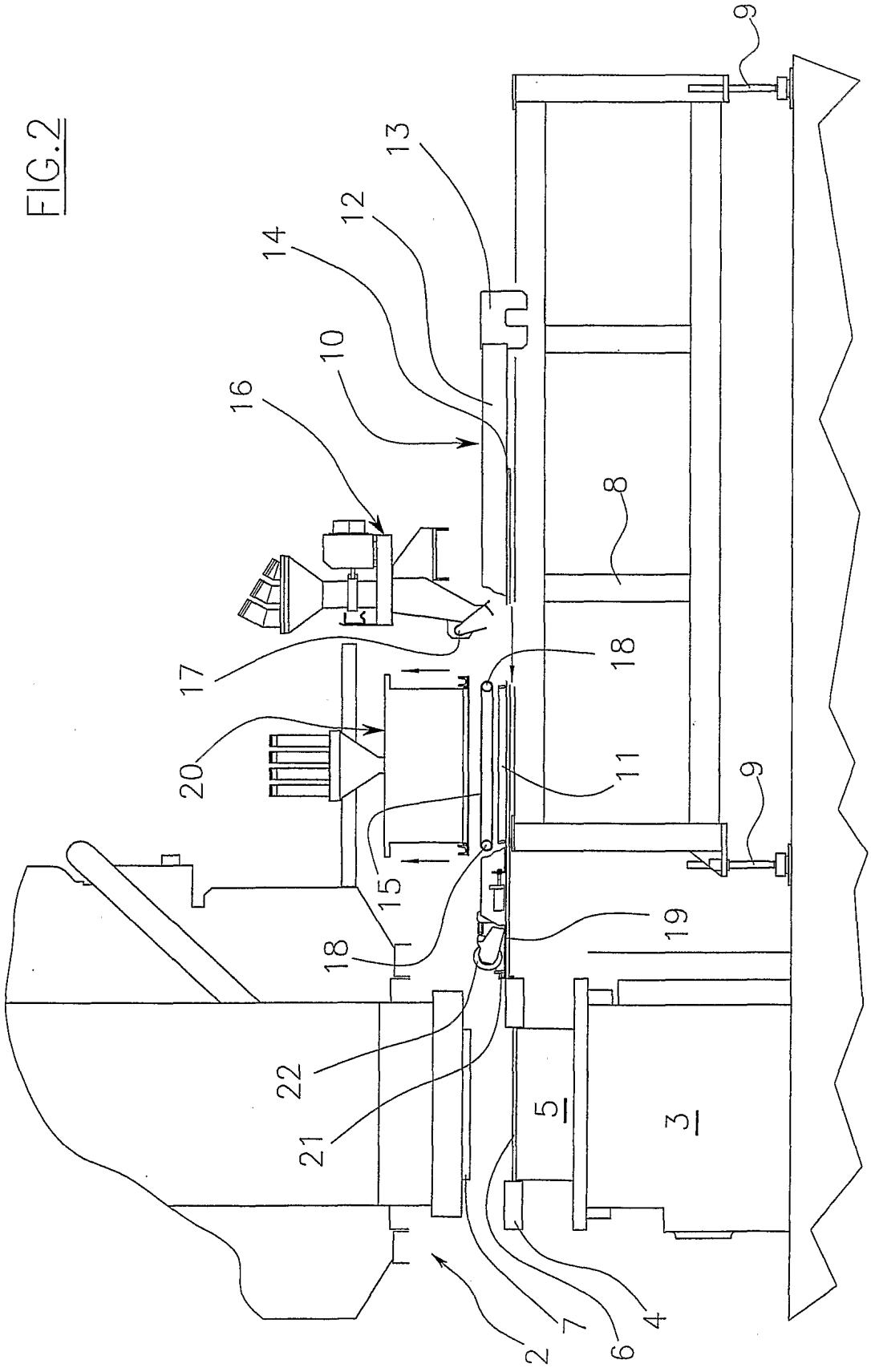


FIG.3

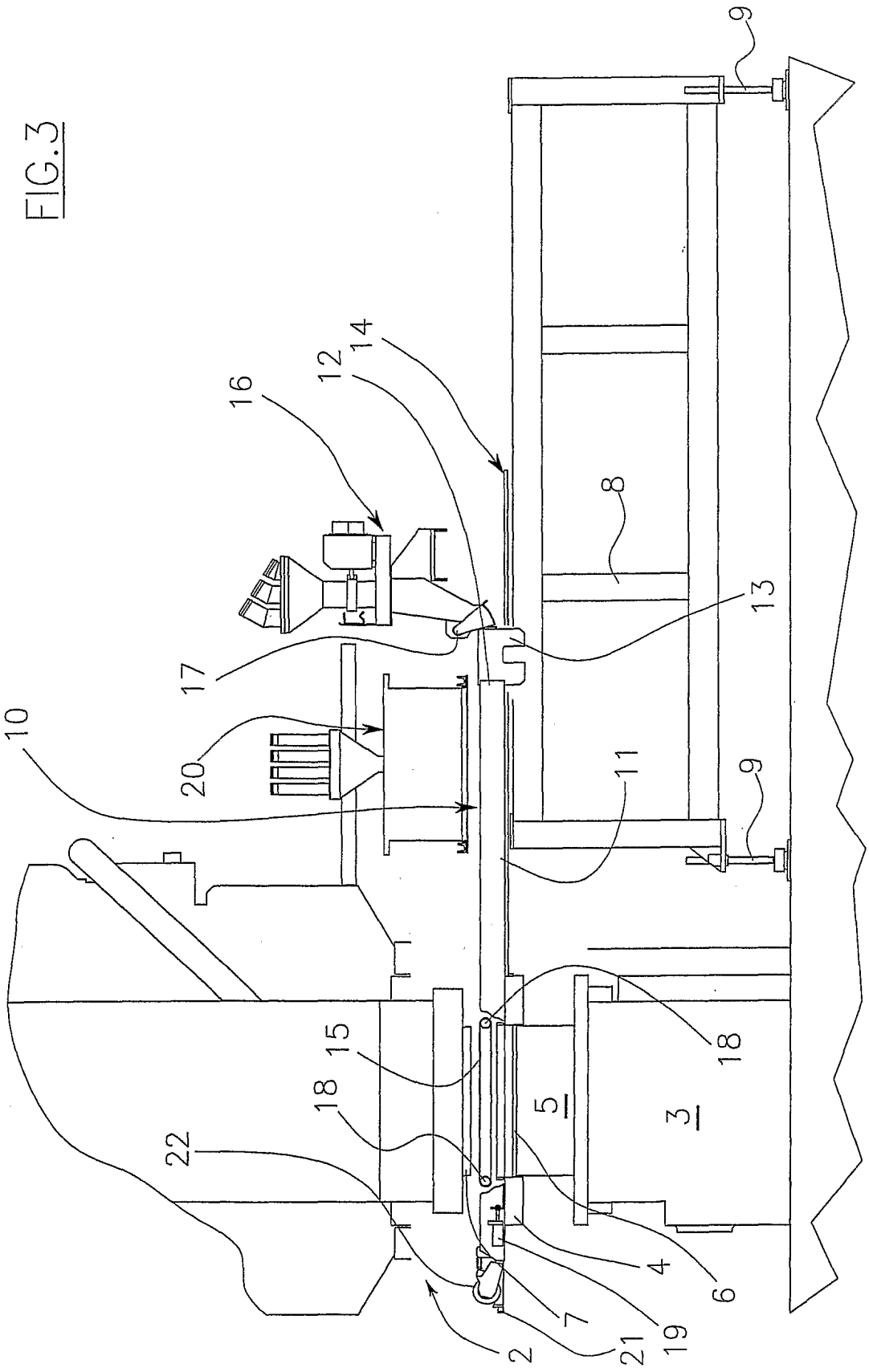


FIG.4

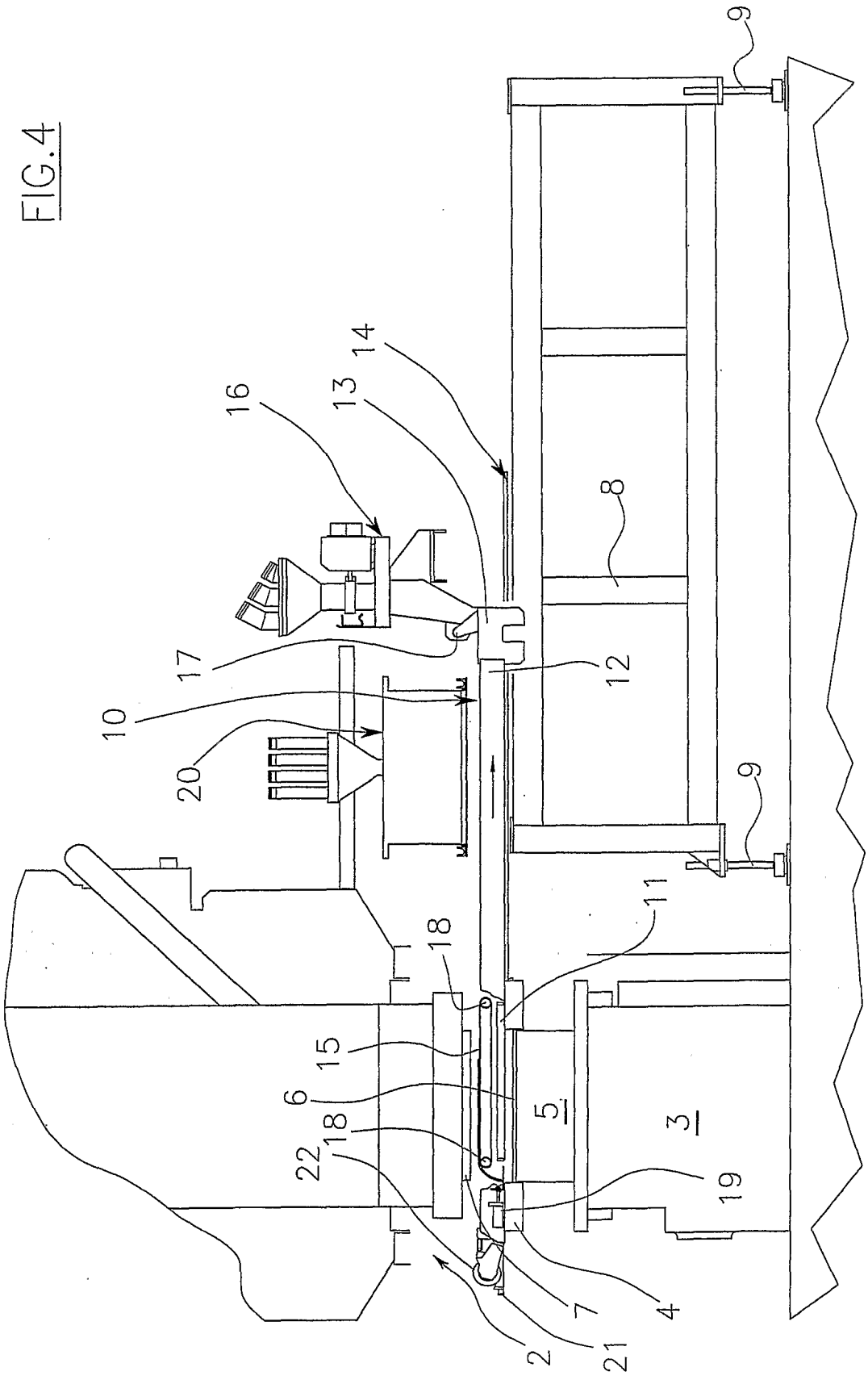


FIG.5

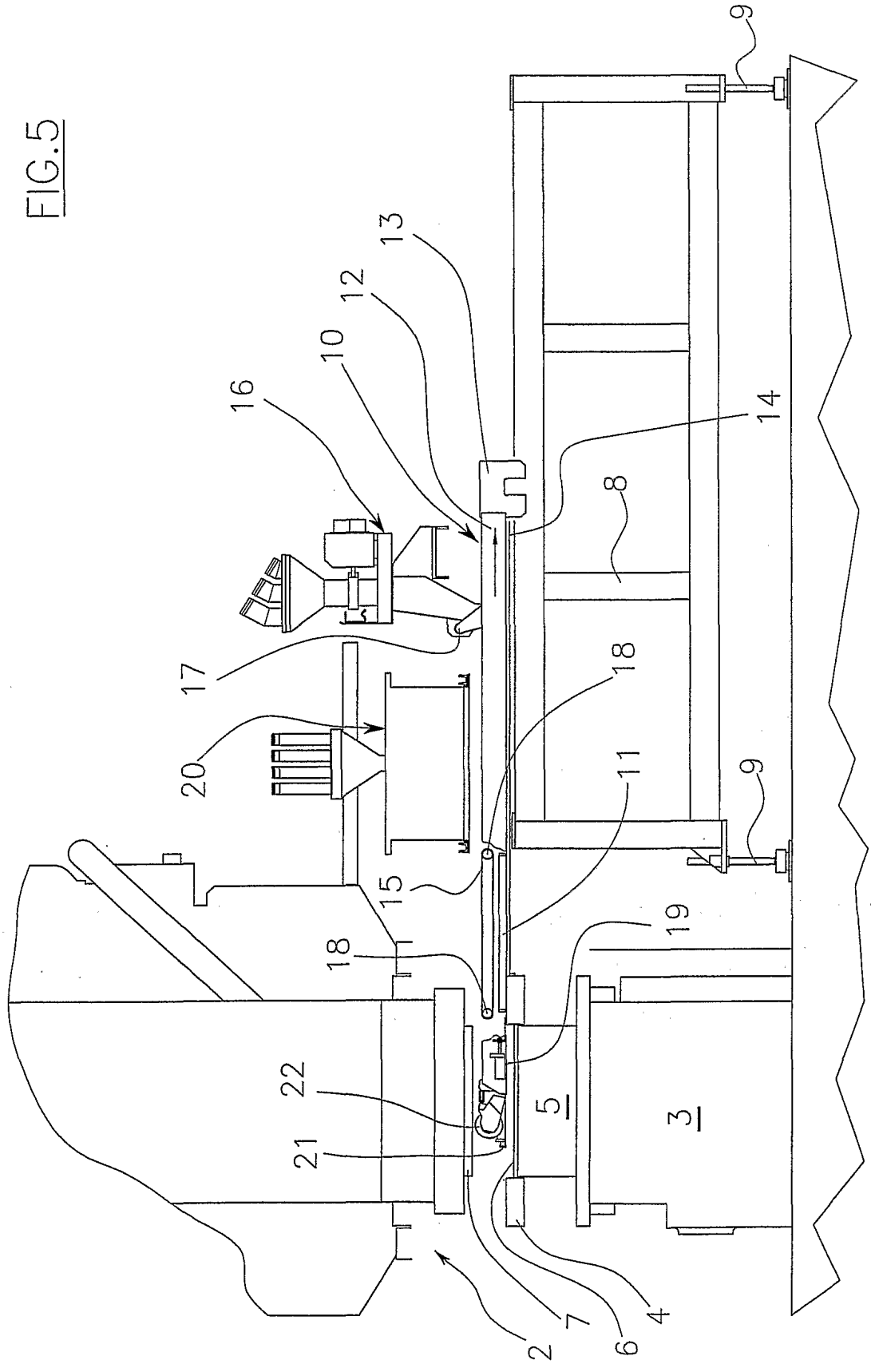
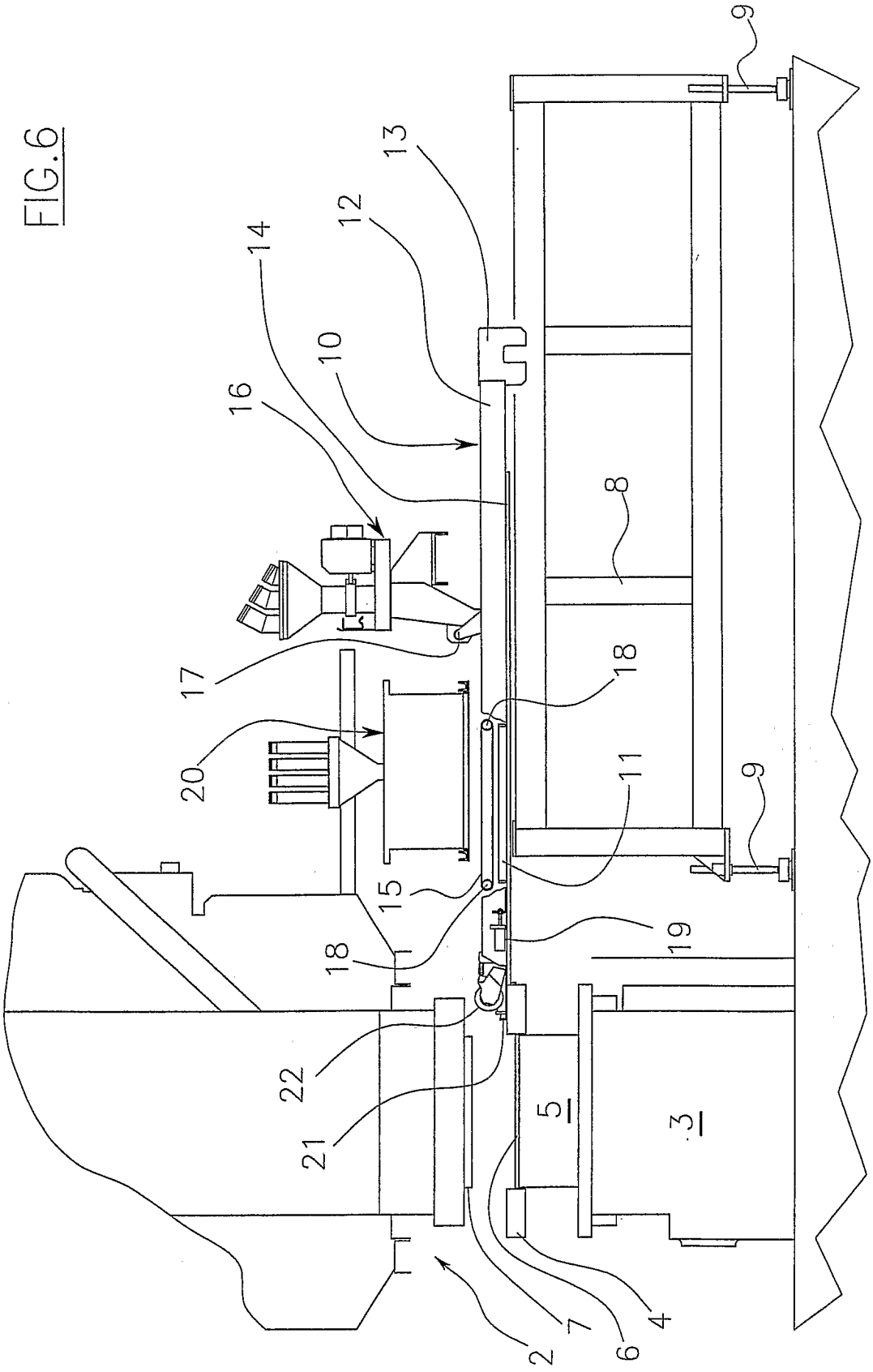


FIG.6



INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B28B13/02 B30B15/30

According to International Patent Classification (IPC) or to both national classification and IPC

B FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B28B B30B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
A	EP 1 097 911 A (LO SCALINO S.R.L) 9 May 2001 (2001-05-09) paragraph '0068! - paragraph '0073!; figures 4-6,11-16,22-30 paragraph '0081! - paragraph '0093! paragraph '0096! - paragraph '0108!	1-4
A	EP 1 145 813 A (OFFICINA C.M.S. S.R.L) 17 October 2001 (2001-10-17) paragraph '0010! - paragraph '0023!; figures 4,6-10	1-4
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Date of the actual completion of the international search	Date of mailing of the international search report
11 October 2005	25/10/2005

Name and mailing address of the ISA	Authorized officer
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Information on patent family members

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